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«STRUCTURES WHICH CAN BE DISMANTLED AND FOLDED,
CONSISTING OF INTERCONNECTING TUBULAR ELEMENTS»

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The present invention relates to folding structures consisting of interconnected extended tubular elements. More particularly, the present invention relates to portable folding structures which can be extended horizontally or vertically, that
10 can be used for product display or as supports for raised loads, such as for instance platforms, walkway bases, technical pavements, rostrums, stands, boxes, comprising a plurality of interconnected parallelepiped cells in which the sides faces of the parallelepiped are defined by a pair of tubular elements interconnected by a scissors-connector. In these structures each extremity of the extended tubular
15 elements which constitute the pair of scissors-connected elements, is inserted by rotation into a seat in an articulated universal joint, also parallelepiped in form. The universal joint presents, on one of the larger faces, a hinging seat corresponding to each side face, and can therefore accept up to four extremities of tubular elements. In the case of structures that must bear heavy loads a variation
20 to the embodiment described above has been used for some time in which the universal joints provide for a fifth seat on the surface of said face into which is fixed a tubular element, within which another tubular element of smaller diameter is inserted as a sliding fit and whose extremity is inserted into the face of a similar universal joint. The tubular element inserted into the face of the universal joint is

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fixed and is stopped against the opposed joint into which is inserted the extremity of element that slides inside.

It is often necessary to arrange for exhibition structures or raised support higher than is attainable with the single structure. In this case, more identical (or similar) structures are superimposed such that, in the overlap, the upper faces of the universal joints of the underlying structure are matched to the corresponding lower faces of the upper structure.

Devices are known to increase the height of the exhibition or support systems mentioned above. For instance, an exhibition system that could give rise to structures of different height is described in EP-A-0 419 006.

The structure described in said patent is complex, provides for a plurality of articulated elements and therefore requires long assembly and dismantling times.

The system proposed in the EP-A-0 884 425 provides for uniting the joints of two structures by connecting the extremities of the two telescopic elements, for instance by means of screw or pin systems.

This system also presupposes complex and onerous setting-up operations, as well as relatively long dismantling and assembly times.

One purpose of the present invention is provision of a simple and rapid method of joining two or more structures of the type consisting of pairs of extended tubular shear-connected elements, whose extremity is hinged in universal joints and in which the universal joints are defined integral with equal and parallel larger faces and are preferably substantially parallelepiped in form and present four hinging seats set in one of the larger faces near a side face.

A second purpose of the present invention is the coupling of two or more superimposed structures of the type described above that furthermore present in the inside surface of the face of the universal joint, in which are seats for the hinging of the extended elements, a fifth seat into which is fixed the extremity of
5 an extendible telescopic tubular element whose other extremity is fixed to the opposite underlying universal joint.

And a further purpose of the present invention is a device that allows the coupling of the aforesaid structures.'

The purposes of the present invention are achieved using the universal joints
10 described above that present grooves along the sides of the face, in which are scheduled seats for lodging the extended elements in proximity to the edges of the type and parallel to the same edges, that cooperate with C-sectioned fixing elements to hold two matching universal joints belonging to two superimposed structures together.

15 According to a preferred embodiment of the invention, the C-shaped fixing elements are substantially rectangular sheets of flexible material with two opposite edges folded and inverted, in the following also referred to as the C-shaped spring or C-spring. The folded and inverted edges of the C-shaped spring present dimensions and forms corresponding to those of the grooves cut into the faces of
20 the universal joints.

The C-shaped springs with inverted edges cover most of the corresponding side faces of the superimposed universal joints and they could provide for, in some

cases, grooves in correspondence with seats of lodgement of the extended elements and they could take different configurations depending on their use. The C-shaped springs could be applied to all the side faces of all the joints that are matched in the overlap or in coupling of multiple structures.

5 It has been found, however, that to get sufficient stability in most cases it is sufficient to apply the C-springs only on the external faces of the universal joints that are on the external surface of the structure. The application of the C-springs to only the external faces of the joints enormously simplifies the operation of assembly and dismantling of the coupled structures.

10 To further guarantee the stability of the joined structure, the faces of the matching joints could present one or more suitable perforations for the housing pivots that prevent any movement of the joints on the contact pivot.

The present invention will now be illustrated in more detail making reference to preferred embodiments of the same that are described with the aid of the attached
15 drawings. These sketches and the embodiments are by way of example and must not be interpreted as limiting the invention.

In the sketches:

- figure 1 shows a view in perspective of a universal joint according to the invention;
- 20 - figure 2 shows a side view of the C-sectioned spring that could cooperate with the joint of figure 1;
- figure 3 is a view in perspective of the spring of figure 2;

- figure 4 shows a side view of two joints belonging to two superimposed structures fixed together by means of the springs of figures 2 and 3.
- figure 5 is an exploded view of a preferred system of connection of structures according to the invention.
- 5 - figure 6 is a simplified scheme of two superimposed structures coupled according to invention.

With reference to figures 1 to 4, the universal joint 1 presents four grooves 2, 2', 2» and 2'» on one of its larger faces in correspondence to the side face, that could accept hinged extended tubular elements not shown in the figure. On face 3 of the universal joint that presents the four grooves (2, 2', 2» and 2'») there is an opening 10 4 to fix the extremity of a tubular extended element 5, within which another tubular element slides, not shown in the figure and connected with a corresponding universal joint. Along the edges of said face of the universal joint are grooves 6 which constitute seats to accept one of the extremities 8 of a spring 15 9 as shown in figure 4.

The insertion of the two extremities of the spring 9 into the grooves on the non-matching faces of two joints belonging to two superimposed structures allows the coupling of the structures to be maintained fixed. The insertion of the springs is easily achieved after the structures have been superimposed by snapping the 20 inverted extremities 8 of the springs 9 into said grooves, where they remain locked. The operation of dismantling is performed quickly, for instance, by removing one of the two inverted extremities 8 of the C-springs from the groove.

Figure 5 shows a preferred embodiment of the invention. This provides for the use of universal joints whose face opposite to that in which the grooves have been made contains the opening 10 that can accept pivots 11 that prevent any relative movement of the joints in the horizontal plane.

- 5 Figure 6 shows a side view of a support system for elevated loads according to the invention, obtained by joining two structures.

The said figure shows the extended elements 12 joined with scissors-connection and hinged in seats 2 of the universal joint, as well as the telescopic extension elements 5, that assure resistance to loading of the structure.